Claim Amendments

Please amend claims 1, 4, 5, 8-10, 13, 17-20 as follows.

Please cancel claims 2, 6, 7, 11, 12, 14-16 as follows.

Please add new claims 21-27 as follows:

Claims as Amended

1. (currently amended) A method for plasma etching ~~in an etch chamber~~ with improved etching selectivity for a nitride containing material with respect to a photoresist layer comprising the steps of:

providing a substrate ~~having~~ comprising a low dielectric constant material including at least one overlayer of a nitride containing material;

~~depositing~~ forming a photoresist layer overlying the at least one least one overlayer of a nitride containing material;

photolithographically patterning said photoresist layer ~~photolithographically~~ for an etching process;

~~providing an ambient in said etch chamber conducive to~~ for ~~forming a plasma including at least nitrogen and at least one compound selected from the group consisting of fluorocarbons and hydrofluorocarbons;~~

~~forming a plasma in said etch chamber in the presence of microwave power; and;~~

~~adding oxygen and adjusting a nitrogen to oxygen ratio whereby the at least one overlayer of a nitride containing material is preferentially etched through a thickness to form an etch opening.~~

carrying out a first plasma etching process consisting essentially of hydrogen containing fluorocarbons and nitrogen to etch through a thickness portion of the at least one overlayer of a nitride containing material; and,

optionally adding oxygen during the first plasma etching process to form a nitrogen to oxygen ratio of at least about 5 to control a critical dimension bias.

2. (cancelled)

3. (original) The method of claim 1, wherein the at least one overlayer of a nitride containing material comprises a dielectric anti-reflective coating (DARC) layer.

4. (currently amended) The method of claim 1, ~~3~~, wherein the at least one overlayer of a nitride containing material is selected from the group consisting of silicon nitride, silicon oxynitride, and titanium nitride.

5. (currently amended) The method of claim 1, further comprising the step of depositing a polymer layer comprising CN on at least a sidewall of an opening defined ~~by the etch opening and a photoresist opening thereby preferentially etching a bottom portion of the etch opening~~ by the first plasma etching process.

6. (cancelled)

7. (cancelled)

8. (currently amended) The method of claim 1, further comprising:

~~flowing~~ supplying nitrogen ~~into said etch chamber~~ at a flow rate from about 50 to about 300 sccm;

~~flowing~~ supplying oxygen ~~into said etch chamber~~ at a flow rate from about 2 to about 10 sccm;

~~flowing~~ supplying at least one ~~of a fluorocarbon and~~ hydrofluorocarbon ~~into said etch chamber~~ at a flow rate from about 20 to about 100 sccm; and,

maintaining ~~the ambient~~ a plasma pressure ~~in said etch chamber~~ from about 40 to about 100 millitorr.

9. (currently amended) The method of claim 1, wherein the first plasma etching process comprises supplying microwave power ~~is supplied~~ at a power level of from about 1000 to about 1500 Watts.

10. (currently amended) A method for plasma etching with improved etching selectivity for a low-K carbon containing dielectric material layer ~~in an etch chamber~~ and underlying etch stop layer comprising the steps of:

providing a substrate ~~having~~ comprising a low-K carbon containing dielectric material layer overlying a nitride containing etch stop underlayer;

providing a photoresist layer overlying the low-K carbon containing dielectric material layer;

defining a pattern comprising the photoresist layer such that a portion of the low-K carbon containing dielectric material layer is exposed for etching ~~according to a photolithographic process~~; and,

~~providing an ambient in said etch chamber conducive to forming a plasma including at least nitrogen and at least one compound selected from the group consisting of fluorocarbons and hydrofluorocarbons;~~

~~forming a plasma in said etch chamber in the presence of microwave power; and,~~

~~adjusting a fluorine to carbon ratio whereby the dielectric material layer is preferentially etched through a thickness of said dielectric material layer.~~

carrying out a first plasma etching process comprising hydrogen containing fluorocarbons, nitrogen, and oxygen at a nitrogen to oxygen ratio of at least about 10 to etch and a fluorine to carbon ratio within a range of about 2 to about 3 to etch through a thickness portion of the low-K carbon containing dielectric material layer.

11. (cancelled)

12. (cancelled

13. (currently amended) The method of claim 10 ~~12~~, wherein the low-K carbon containing dielectric material layer has a dielectric constant of at most about 3.0.

14. (cancelled)

15. (cancelled)

16. (cancelled)

17. (currently amended) The method of claim 10, wherein the ~~ambient in said etch chamber has~~ first plasma etching process comprises a pressure from about 40 to about 60 millitorr.

18. (currently amended) The method of claim 10, wherein the first plasma etching process comprises supplying microwave power ~~is supplied~~ at a power level of from about 1000 to about 1800 Watts.

19. (currently amended) The method of claim 10, further comprising the steps of:

~~flowing~~ supplying nitrogen ~~into said etch chamber~~ at a flow rate from about 150 to about 300 sccm; and,

~~flowing~~ supplying oxygen ~~into said etch chamber~~ at a flow rate from about 2 to about 10 sccm; and,

~~flowing~~ supplying at least one ~~of a fluorocarbon and~~ hydrofluorocarbon ~~into said etch chamber~~ at a flow rate from about 5 to about 15 sccm.

20. (currently amended) The method of claim 10, further comprising a second plasma etching process wherein oxygen is not provided ~~absent the step of providing a substantially oxygen free ambient in said etch chamber prior to etching~~ during etching

through ~~the dielectric material layer into~~ the nitride containing underlayer.

21. (new) The method of claim 1, wherein the at least one hydrogen containing fluorocarbon comprises CHF_3.

22. (new) The method of claim 10, wherein the at least one hydrogen containing fluorocarbon is selected from the group consisting of C_4F_8, C_5F_8, or C_4F_6, and mixtures thereof.

23. (new) A method for plasma etching a via opening with improved nitride and low-K carbon containing IMD layer etching selectivity with respect to a photoresist layer comprising the steps of:

providing a substrate comprising a low-K carbon containing IMD layer including an overlying nitrogen containing dielectric anti-reflective coating (DARC) layer and an underlying etch stop layer;

forming and patterning a photoresist layer overlying the DARC layer;

carrying out a first plasma etching process consisting essentially of hydrogen containing fluorocarbons, nitrogen, and oxygen at a nitrogen to oxygen ratio of at least about 5 to etch through a thickness of the DARC layer;

carrying out a second plasma etching process comprising hydrogen containing fluorocarbons, nitrogen, and oxygen at a nitrogen to oxygen ratio of at least about 10 to etch and a fluorine to carbon ratio within a range of about 2 to about 3 to etch through a thickness portion of the low-K carbon containing IMD layer; and,

carrying out a third plasma etching process consisting essentially of hydrofluorocarbons and nitrogen to etch through a thickness of the etch stop layer.

24. (new) The method of claim 23, wherein the DARC layer comprises silicon oxynitride.

25. (new) The method of claim 23, wherein the low-K carbon containing IMD layer has a dielectric constant of at most about 3.0.

26. (new) The method of claim 23 wherein the first plasma etching process comprises a nitrogen to oxygen ratio of about 5 to 1 to about 150 to 1.

27. (new) The method of claim 23 wherein the second plasma etching process comprises a nitrogen to oxygen ratio of about 15 to 1 to about 150 to 1.